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ASPHONDYLIA ANTHOCERCIDIS, A NEW SPECIES OF CECIDOMYIIDAE (DIPTERA) INDUCING FRUIT GALLS ON *ANTHOCERCIS LITTOREA* (SOLANACEAE) IN WESTERN AUSTRALIA

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Summary

Kolesik, P., Whittemore, R., & Stace, H. M. (1997) *Asphondylia anthocercidis*, a new species of Cecidomyiidae (Diptera) inducing fruit galls on *Anthocercis littorea* (Solanaceae) in Western Australia. *Trans. R. Soc. S. Aust.* **121**(4), 157-161, 28 November, 1997.

The fruit galls on the Western Australian yellow tailflower, *Anthocercis littorea* Labill. (Solanaceae), reduce the reproductive potential of this plant, but their causative agent has, until now, been unknown. Our research has shown that a new gall midge species, *Asphondylia anthocercidis*, induces these galls. The larva, pupa, male and female of the new species are described and illustrated.

Key Words: Diptera, Cecidomyiidae, *Asphondylia anthocercidis*, *Anthocercis littorea*, Western Australia.

Introduction

The gall midge fauna of Western Australia is poorly known, with only two species having been described previously (Gagné 1989). One of them, *Ipomyia bornemisszai* Colless, is a species which presumably feeds on fungi growing in the soil and in leaf litter (Colless 1965). The biology of the second species, *Eocincticornia australasiae* Felt, is unknown (Felt 1915), although this species is likely to be a plant feeder considering that its congener, *E. malarskii* Kolesik, causes galls on *Eucalyptus fasciculosa* in South Australia (Kolesik 1995a).

The yellow tailflower, *Anthocercis littorea* Labill. (Solanaceae), a shrub which grows to 3 m, is endemic to the south-west coast of Western Australia, primarily on calcareous sands in disturbed habitats such as recently burnt areas, roadsides, fire breaks and cleared lots (Purdie *et al.* 1982; Whittemore[1]). The fruit galls on *A. littorea* have been known for some time (Purdie *et al.* 1982) but their causative agent has remained unknown. In July 1996, one of us (R. W.) collected fruit galls from *A. littorea* containing larvae and pupae, from which adults were reared. The gall-inducer proved to be a new species of gall midge which is described below. The development of the galls and their impact on the reproduction of *A. littorea* are described by Whittemore[1].

The genus *Asphondylia* in the context of this paper is defined by Kolesik (1997). The new species is to be attributed to P. K.

Material and Methods

Stems of *Anthocercis littorea* bearing fruit galls were collected at Hillarys, about 20 km north-east of Perth, on 23.vii.1996. A small number of galls was dissected and the larvae and pupae preserved in 70% ethanol. Larvae and pupae retained within galls were reared to adults on stems which were kept in plastic vials. Larvae pupated within the galls. Emerged gall midges were preserved together with pupal skins in 70% ethanol. Canada balsam mounts of the type series for microscopic examination were prepared according to the technique outlined by Kolesik (1995a). All measurements refer to the type series. The type specimens and other material retained in 70% ethanol are deposited in the South Australian Museum, Adelaide (SAMA) and Australian National Insect Collection, Canberra (ANIC).

Asphondylia anthocercidis sp. nov.
(FIGS 1-15)

Holotype: ♂, Hillarys, Western Australia [31°48' S, 115°45' E], emerged 28.vii.1996, R. Whittemore, reared from larva from fruit gall on *Anthocercis littorea* Labill., gall collected 23.vii.1996, 121335 [SAMA].

Paratypes: 2 ♂♂, 3 ♀♀, 5 pupal skins [SAMA], 3 ♂♂, 3 ♀♀, 4 pupal skins [ANIC], all same data but emerged 28-30.vii.1996; 2 larvae [SAMA], 2 larvae [ANIC], all collected with holotype.

Other material [all SAMA]: 2 ♂♂, 5 ♀♀, 2 pupal skins, 4 pupae, all same data as paratypes; 2 larvae, collected with holotype.

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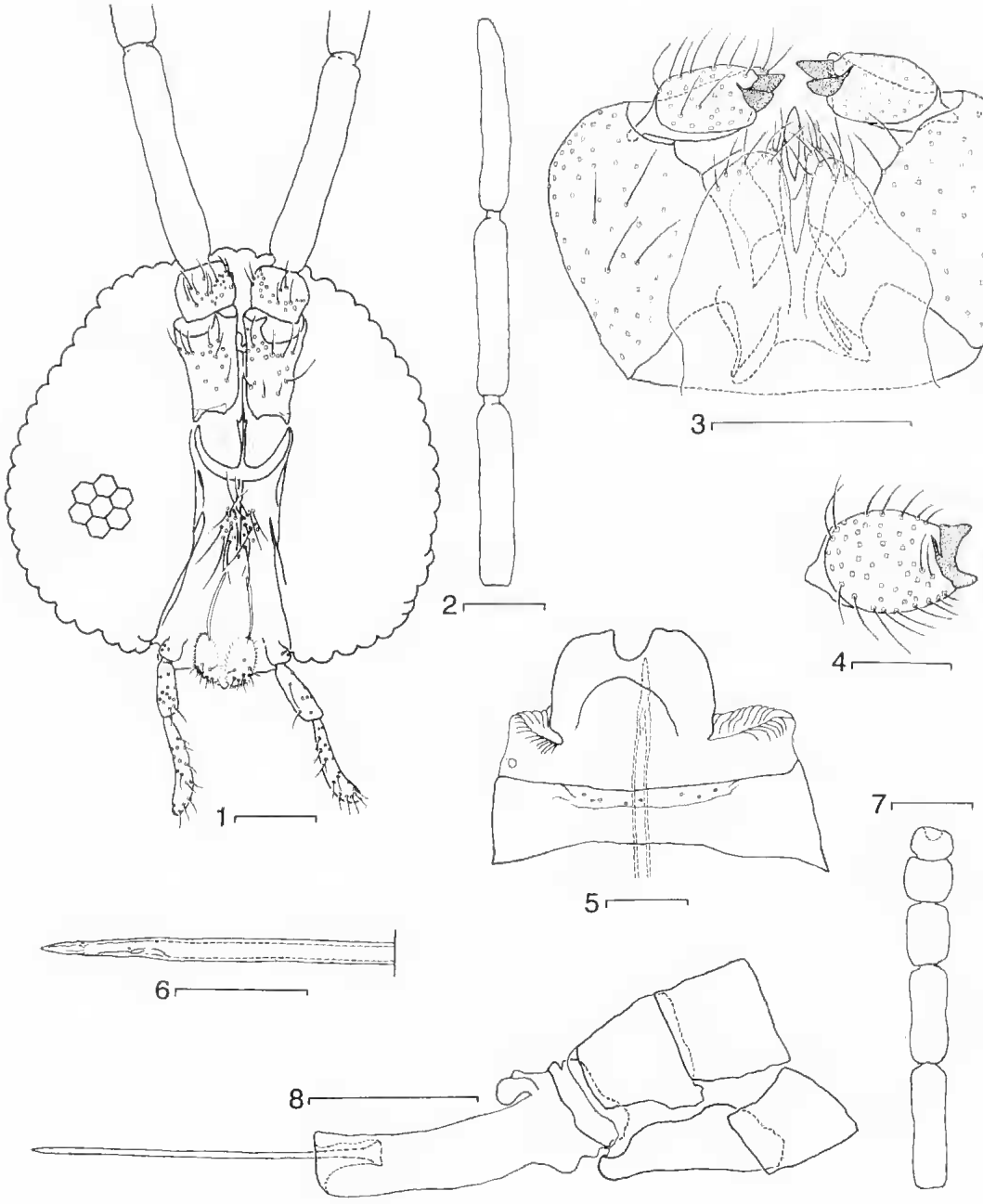
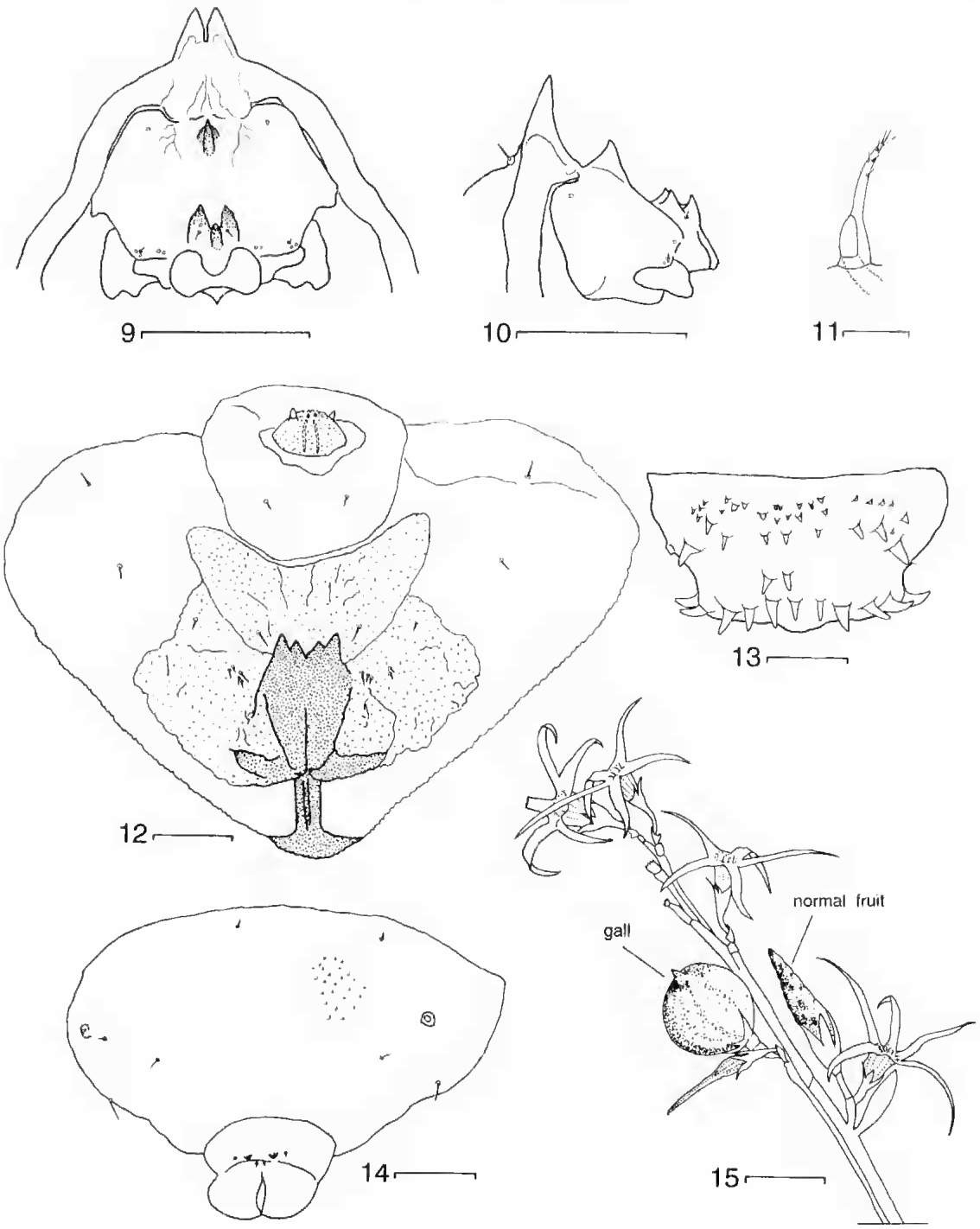
Whittemore, R. (1996) Aspects of the insect-induced fruit galls and reproductive biology of *Anthocercis littorea* (Solanaceae). BSc (Hons) thesis, University of Western Australia (unpubl.).



Figs 1-8. *Asphondylia anthocercidis* sp. nov.: 1 - 4 male; 5 - 8 female. 1. Head in frontal view. 2. Last three flagellomeres. 3. Genitalia in dorsal view. 4. Gonostylus in posterior view. 5. Basal lobes on ovipositor in dorsal view. 6. End of ovipositor in lateral view. 7. Last five flagellomeres. 8. End of abdomen in lateral view. Scale bars = 100 µm 1-3, 5-7; 50 µm 4; 500 µm 8.



Figs 9 - 15. *Asphondylia anthocercidis* sp. nov.: 9 - 11, 13 pupa; 12, 14 larva; 15 infestation. 9. Anterior part in ventral view. 10. Anterior part in lateral view. 11. Prothoracic spiracle. 12. Head and first thoracic segment in ventral view. 13. Last abdominal segment in ventral view. 14. Last two abdominal segments in dorsal view. 15. Fruit gall on *Anthocercis littorea* Labill. [redrawn from Rippey & Rowland (1995)]. Scale bars = 500 µm 9,10; 50 µm 11; 100 µm 12-14; 10 mm 15.

Description

Male (Figs 1-4)

Colour: sclerotized parts of body reddish-brown, non-sclerotized parts of abdomen grey.

Head. Antenna: scape broadest distally, 1.7-2.0 x breadth at distal end, 2.6-2.7 x length of pedicel; pedicel width 1.2-1.4 x length; first flagellomere 1.8-2.1 x length of scape, flagellomeres evenly cylindrical; circumfila dense, equally distributed along flagellomeres. Eye facets hexagonoid, eye bridge 8-9 facets wide. Frons with 10-17 setae per side. Labella prominent, laterally with 7-10 setae, setulose. Maxillary palpus 3-segmented, segments successively and progressively longer.

Thorax. Wing length 3.4 mm (range 3.1-3.7), width 1.3 mm (1.1-1.4). Sc cell pigmented proximally. Claws of all legs subequal in size and similar in shape, as long as empodia.

Abdomen. Genitalia: gonostylus with two large, apical teeth of same length; aedeagus elongate and narrow, reaching middle of gonostylus.

Female (Figs 5-8)

Frons with 9-20 setae per side, labella with 7-9 setae laterally. Circumfila comprising two longitudinal and two short transverse bands. Wing length 3.6 mm (3.3-3.9), width 1.4 mm (1.2-1.5). Seventh abdominal sternite 1.8 (1.6-2.2) x length of sixth. Genitalia: ovipositor 1.9 x (1.8 -2.0) length of seventh sternite; basal lobes on ovipositor broad in dorsal view, divided in posterior third medially; fused cerci glabrous.

Pupa (Figs 9-11, 13)

Colour: brown. Total length 4.0 mm (3.6-4.5). Antennal horns not serrated, 242 µm (237-247) long. One upper and three lower frontal horns. Prothoracic horn slightly curved, basal part about 2 x width of terminal third, terminal third setose. Abdominal dorsal spines simple, straight, with 2-3 pairs on last segment curved laterally.

Mature larva (Figs 12, 14)

Colour: yellowish-white. Total length 3.4 mm (2.6-4.1). Head capsule strongly pigmented, postero-lateral extensions not developed. Spatula with four anterior teeth, inner pair smaller than outer, shaft narrow, broadened both at mid-length and base, surrounded anteriorly and laterally by extensive pigmented area. Each side of spatula with triplet and pair of lateral papillae, all setose. Six terminal papillae present, one pair corniform, 2 pairs with short setae, other papillae as for *Asphondylia* (Möhn 1955).

Gall and biology

This gall midge induces deformation of fruits of *Anthocercis littorea*. The unicarpellate ovaries are transformed into glabrous, spherical to ovate, nippled galls, 7-18 mm long and 7-13 mm wide (Fig. 15) and bright green to purple in colour. Inside the gall a chamber, about 3 mm long and 2 mm wide, is occupied by one larva. The chamber is always lined with fungal mycelia. Although the fungus was abundant in the many galls examined, no sexual stages were observed and the fungus remains unidentified. Viable seeds are rarely produced in galls although pollination is essential to retain the gall on the plant. The numbers of galls in *A. littorea* populations are often very high, with the galls outnumbering the normally-developed fruits by up to 38 times (Whittemore[1]).

Pupation takes place within the gall. At the end of its development the pupa cuts an opening in the gall and lifts most of its body outside the gall. The pupal skin then splits open and the adult emerges. At Hillarys in 1996, the adults emerged throughout the entire host plant flowering period, i.e. from April to September.

Distribution

Asphondylia anthocercidis sp. nov. is sympatric with *A. littorea* across the entire geographic distribution of the host plant, which ranges from Kalbarri [27°50' S, 114°07' E] in the north to Israelite Bay [34°27' S, 119°23' E] in the south (Whittemore[1]).

Etymology

The name is derived from the generic name of the host plant.

Remarks

Asphondylia is a worldwide genus with six species previously described from Australia. The life history of three of them is known: *A. dodonaeae* Kolesik induces galls on leaves of *Dodonaea viscosa* Jacq. subsp. *spathulata* (Smith) West. and *A. inflata* Kolesik and *A. viriciformis* Kolesik induce galls on branch segments of *Halosarcia pergranulata* (Black) Wilson subsp. *pergranulata* and *H. indica* subsp. *leiostachya* (Benth.) Wilson, respectively (Kolesik 1995b, 1997). Life histories of two other species, *A. loewi* Skuse and *A. rubicunda* Skuse, are unknown (Skuse 1888, 1890). The remaining species, *A. hilli* Edwards, has been reported to induce galls on the stem of an unidentified plant (Edwards 1916). *Aspondylia hilli*, *A. loewi* and *A. rubicunda* are not considered in the present paper. The descriptions of these three species were superficial and therefore it is

not possible to compare them with each other or with *A. dodonaeae*, *A. inflata*, *A. ericiformis* or *A. anthoceridis*. A review of the Australian species of this genus is planned by P. K.

The new species differs from *Asphondylia dodonaeae* in the longer adult scape, the wider teeth on the gonostylus, the unserrated antennal horns and the presence of both upper and lower frontal horns in the pupa, the shafted spatula and the presence of a pigmented area around the larval spatula. The new species can be distinguished from both *A. inflata* and *A. ericiformis* by several characters. In *A. anthoceridis*, the aedeagus reaches the middle of gonostylus, pupae have three lower frontal horns, the prothoracic horn is setose at the distal third and is about twice as wide at the base as is the distal third. At least two of the dorsal spines on the last pupal segment are curved laterally and the spatula has four anterior teeth. In both *A. inflata* and *A. ericiformis*, the aedeagus extends beyond the middle of the gonostylus. The pupa of *A. inflata* has one lower frontal horn and that of *A. ericiformis* has none. In both species, the prothoracic horns are asetose and about four times wider at the base than at the terminal third. In the pupa of *A. inflata*, only the prominent pair of abdominal dorsal spines on the last segment is curved laterally; in *A. ericiformis* all spines are straight. In both species the spatula has two anterior teeth.

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